CLAIMS:

1. A system for servicing data transactions within a processing device using common data paths, the system comprising:

a plurality of source agents operable to transmit a plurality of data cells;

a plurality of destination agents operable to receive a plurality of data cells;

a plurality of virtual channels for transporting said data cells between said source agents and said destination agents; and

a switch comprising:

an active state combiner operable to generate active state data corresponding to all possible combinations of said source agents and said destination agents that are active for transmission or reception, respectively, of data cells;

a connection scheduler operable process said active state data to generate connection grants for selected pairs of said source and destination agents;

a plurality of virtual channel schedulers operable to process said active state data to generate virtual channel grants for selected pairs of source and destination agents;

wherein a data cell is transferred between a selected source agent and a selected destination agent over a selected virtual channel during a processing cycle; and

wherein said connection scheduler and said virtual channel scheduler process said active state data simultaneously to generate said connection grants and said virtual channel grants.

2. The system of claim 1, wherein a single data cell is transferred between all of said selected source agents and said selected destination agents during a first data cycle and wherein said active state data is provided to said active state combiner in a subsequent data cycle to generate new active state data corresponding to all possible combinations of said source agents and said destination agents that are active for transmission or reception, respectively, of data cells in said subsequent data cycle.

3. The system of claim 1, wherein said plurality of virtual channel selectors comprise an arbiter for selecting a single virtual channel from a plurality of available virtual channels.

4. The system of claim 3, wherein said arbiter implements a round-robin arbitration protocol.

5. The system of claim 1, further comprising a packet interleaver operable to generate control signals to control transmission of said data cells to enforce a predetermined packet interleaving protocol.

6. The system of claim 5, wherein said predetermined packet interleaving protocol prevents data packets from two source agents from being interleaved to the same destination agent over the same virtual channel.

7. The system of claim 6, wherein said interleaving protocol requires data transmission between a source agent and a destination agent over a specified virtual channel to be restricted to data cells comprising a specific data packet until all data cells of said specified data packet have been received by said destination agent.

8. The system of claim 7, wherein said interleaver generates interleaver control signals corresponding to the enforcement of said packet interleaving protocol and wherein said active state combiner receives said interleaver control signals and generates active state data that complies with said packet interleaving protocol.

9. The system of claim 8, wherein said interleaver is operable to use an end-of-packet signal corresponding to the last cell of data comprising a data packet to enforce said interleaving protocol.

10. The system of claim 1, wherein said switch is operable to multicast a data signal to a predetermined set of destination agents in said plurality of destination agents.

11. The system of claim 10, wherein said multicast comprises a data transmission to a predetermined virtual destination agent that is not included within said plurality of destination agents.

12. The system of claim 11, wherein, upon detection of a multicast data transmission request, said connection scheduler:

continues to issue connection grants to said predetermined set of destination agents and associated sources that have a preexisting transfer of data cells corresponding to a data packet until the end-of-packet cell for each respective data packet is detected;

suspends the grant of new connections for the transfer of data cells between source agents and said predetermined set of destination agents;

initiates transmission of a multicast packet to said predetermined set of destination agents upon detection of an end-of-packet data cell for each preexisting data cell transmission; and

resumes processing said active state data to generate connection grants for selected pairs of said source and destination agents upon detection of an end of packet cell in said multicast packet.

13. A method for servicing data transactions within a processing device using common data paths, the method comprising:

receiving state information regarding the active status of a plurality of source agents operable to transmit a plurality of data cells;

receiving state information regarding the active status of a plurality of destination agents operable to receive a plurality of data cells;

receiving state information regarding a plurality of virtual channels for transporting said data cells between said source agents and said destination agents;

generating an active state data table corresponding to all possible combinations of said source agents and said destination agents that are active for transmission or reception, respectively, of data cells;

processing said active state data to generate connection grants for selected pairs of said source and destination agents; and

processing said active state data to generate virtual channel grants for selected pairs of source and destination agents;

wherein said active state data is processed simultaneously to generate said connection grants and said virtual channel grants.

14. The method of claim 13, wherein a single data cell is transferred between all of said selected source agents and said selected destination agents during a first data cycle and wherein said active state data is updated in a subsequent data cycle to generate new active state data table corresponding to all possible combinations of said source agents and said destination agents that are active for transmission or reception, respectively, of data cells in said subsequent data cycle.

15. The method of claim 13, wherein an arbitration protocol is implemented to select a single virtual channel from a plurality of available virtual channels.

16. The method of claim 15, wherein said arbitration protocol comprises a round-robin selection protocol.

17. The method of claim 13, further comprising generating control signals to control transmission of said data cells to enforce a predetermined packet interleaving protocol.

18. The method of claim 17, wherein said predetermined packet interleaving protocol prevents data packets from two source agents from being interleaved to the same destination agent over the same virtual channel.

19. The method of claim 18, wherein said interleaving protocol requires data transmission between a source agent and a destination agent over a specified virtual channel to be restricted to data cells comprising a specific data packet until all data cells of said specified data packet have been received by said destination agent.

20. The method of claim 19, wherein said state data table comprises interleaver state data generated by a packet interleaver operable to control transmission of said data cells to enforce a predetermined packet interleaving protocol.

21. The method of claim 20, wherein said interleaver uses an end-of-packet signal corresponding to the last cell of data comprising a data packet to enforce said interleaving.

22. The method of claim 13, wherein said data transaction comprises a multicast data packet transmission to said plurality of source agents.

23. The method of claim 22, wherein said multicast comprises a data transmission to a predetermined virtual destination agent that is not included within said plurality of destination agents.

24. The method of claim 23, wherein, upon detection of a multicast packet request:

connection grants are issued to said predetermined set of destination agents and associated sources that have a preexisting transfer of data cells corresponding to a data packet until the end-of-packet cell for each respective data packet is detected

the grant of new connections for the transfer of data cells between source agents and predetermined set of destination agents is suspended;

transmission of multicast data to said predetermined set of destination agents is initiated upon detection of an end-of-packet data cell for each preexisting data cell transmission; and

processing of said active state data to generate connection grants for selected pairs of said source and destination agents is resumed upon detection of an end of packet cell in said multicast packet.